



**Draft**  
**Total Maximum Daily Load (TMDL)**  
**for the**  
**Big Prairie Creek Watershed**

**Assessment Unit ID Numbers:**

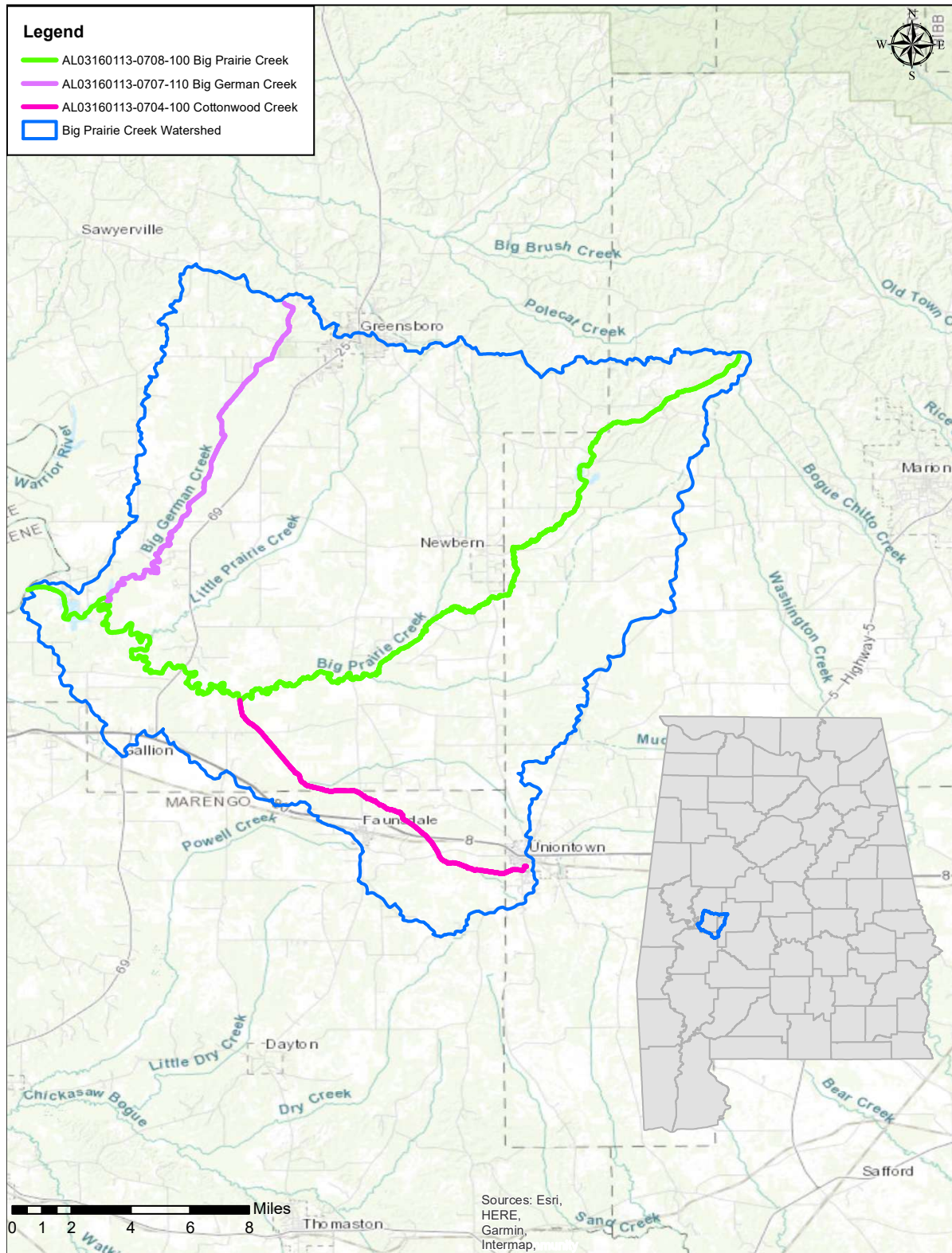
**AL03160113-0708-100 (Big Prairie Creek)**  
**AL03160113-0704-100 (Cottonwood Creek)**  
**AL03160113-0707-110 (Big German Creek)**

**Pathogens (*E. coli*)**

**Hale, Marengo, and Perry counties**

Alabama Department of Environmental Management  
Water Quality Branch  
Water Division  
May 2026

Figure 1: Map of Big Prairie Creek Watershed



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## 1.0 Executive Summary

Section 303(d) of the Clean Water Act and the Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Big Prairie Creek, part of the Black Warrior River basin, is currently included on Alabama's §303(d) list as impaired for pathogens (*E. coli*) from its source to the Black Warrior River (Demopolis Lake). Additionally, the following tributaries to Big Prairie Creek are also listed as impaired for pathogens (*E. coli*): Cottonwood Creek and Big German Creek. Each tributary is listed as impaired from its source to Big Prairie Creek.

Big Prairie Creek begins northwest of Marion, Alabama and flows southwest into the Black Warrior River (Demopolis Lake). The total impaired length of Big Prairie Creek is 44.16 miles. Cottonwood Creek (11.42 miles) begins near Uniontown, Alabama and flows northwest into Big Prairie Creek. Big German Creek (15.21 miles) begins northwest of Greensboro, Alabama and flows southwest into Big Prairie Creek. The total drainage area of the Big Prairie Creek watershed is approximately 257 square miles. Big Prairie Creek and the two impaired tributaries have a use classification of Fish & Wildlife (F&W).

Big Prairie Creek was first included on Alabama's §303(d) list for pathogens in 2018 based on ADEM data collected in 2016 at stations BPRH-44B and BPRH-44C. Cottonwood Creek and Big German Creek were first included on the §303(d) list as impaired for pathogens in 2024 based on data collected by ADEM in 2021 at stations COTH-57C and BGEH-46A, respectively. This data, which can be found in Appendix 7.2, indicated that Big Prairie Creek, Cottonwood Creek, and Big German Creek were impaired for pathogens (*E. coli*).

Additional data for the Big Prairie Creek watershed was collected by ADEM in 2024. For the purposes of this TMDL, the 2021 and 2024 data will be used to assess the water quality of the Big Prairie Creek watershed because it is the most current data and provides the best picture of the current water quality conditions of the streams. The 2026 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody. All the available and recent bacterial data is listed in the Appendix for reference. According to the collected data, these waterbodies are not meeting the pathogen criteria applicable to their use classification.

A mass balance approach was used for calculating the pathogen TMDLs for the Big Prairie Creek watershed. The mass balance approach utilizes the conservation of mass principle. The TMDLs were calculated using the single sample or geometric mean sample exceedance event which resulted in the highest percent reduction. Existing loads were calculated by multiplying the *E. coli* concentrations times the respective in-stream flows and a conversion factor. In the same manner as existing loads were calculated, allowable loads were

calculated for the single sample *E. coli* target of 268.2 colonies/100 mL (298 colonies/100mL-10% Margin of Safety) and geometric mean *E. coli* target of 113.4 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

Tables 1, 2, and 3 give summaries of the estimated existing loads, allowable loads, and percent reductions for Big Prairie Creek, Cottonwood Creek, and Big German Creek, respectively. Tables 4, 5, and 6 list the TMDLs, defined as the maximum allowable *E. coli* loadings under critical conditions, for each waterbody.

**Table 1. *E. coli* Loads and Required Reductions for Big Prairie Creek**

| Source                           | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|----------------------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load               | 3.16E+11                | 2.13E+10                 | 2.95E+11                     | 93%         |
| Geometric Mean Load              | 3.00E+10                | 6.60E+9                  | 2.34E+10                     | 78%         |
| Point Source Load (Newbern WWTP) | 0                       | 2.26E+8                  | 0                            | 0%          |

**Table 2. *E. coli* Loads and Required Reductions for Cottonwood Creek**

| Source             | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|--------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load | 3.02E+12                | 3.35E+11                 | 2.69E+12                     | 89%         |

**Table 3. *E. coli* Loads and Required Reductions for Big German Creek**

| Source             | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|--------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load | 8.30E+11                | 9.20E+10                 | 7.38E+11                     | 89%         |

**Table 4. *E. coli* TMDL for Big Prairie Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 2.37E+10          | 2.37E+9                | 2.26E+8                                  | N/A  | 0                                       | 2.11E+10             | 93%         |

Note: N/A = not applicable

a. Future CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

**Table 5. *E. coli* TMDL for Cottonwood Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 3.72E+11          | 3.72E+10               | N/A                                      | N/A  | 0                                       | 3.35E+11             | 89%         |

Note: N/A = not applicable

a. Future CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

**Table 6. *E. coli* TMDL for Big German Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 1.02E+11          | 1.02E+10               | N/A                                      | N/A  | 0                                       | 9.20E+10             | 89%         |

Note: N/A = not applicable

a. Future CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

Compliance with the terms and conditions of existing and future National Pollutant Discharge Elimination System (NPDES) permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Big Prairie Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

## 2.0 Basis for §303(d) Listing

### 2.1 Introduction

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the TMDL for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified the 44.16-mile segment of Big Prairie Creek from its source to Demopolis Lake as impaired for pathogens (*E. coli*). Big Prairie Creek was originally listed on Alabama's 2018 List of Impaired Waters for pathogens based on data collected in 2016. The State of Alabama has also identified the 11.42-mile segment of Cottonwood Creek from its source to Big Prairie Creek as impaired for pathogens. Cottonwood Creek was originally listed on Alabama's 2024 List of Impaired Waters for pathogens based on data collected in 2021. Lastly, the 15.21-mile segment of Big German Creek from its source to Big Prairie Creek has been identified by the State of Alabama as being impaired for pathogens (*E. coli*). Big German Creek was originally listed on Alabama's 2024 List of Impaired Waters for pathogens based on data collected in 2021.

### 2.2 Problem Definition

Waterbodies Impaired:

Big Prairie Creek – from its source to Demopolis Lake  
Cottonwood Creek – from its source to Big Prairie Creek  
Big German Creek – from its source to Big Prairie Creek

|  |   |
|--|---|
| <u>Impaired Reach Lengths:</u>           | Big Prairie Creek – 44.16 miles<br>Cottonwood Creek – 11.42 miles<br>Big German Creek – 15.21 miles |
| <u>Impaired Drainage Area:</u>           | 256.96 square miles   |
| <u>Water Quality Standard Violation:</u> | Pathogens (Single Sample Maximum)   |
| <u>Pollutant of Concern:</u>             | Pathogens ( <i>E. coli</i> )  |
| <u>Water Use Classification:</u>         | Fish and Wildlife (F&W)   |

Usage Related to Classification:

The impaired stream segments are classified as F&W. Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(5) (a), (b), (c), and (d).

(a) *Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife.*

(b) *Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.*

(c) *Other usage of waters: it is recognized that the waters may be used for incidental water contact year-round and whole body water-contact recreation during the months of May through October, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.*

(d) *Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming areas and will be considered satisfactory for swimming and other whole body water-contact sports.*

*E. coli* Criteria:

Criteria for acceptable bacteria levels for the F&W use classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(e)7(i) and (ii) as follows:

7. Bacteria:

(i) *In non-coastal waters, bacteria of the *E. coli* group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 colonies/100 ml in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.*

(ii) *For incidental water contact and whole body water-contact recreation during the months of May through October, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean *E. coli* organism density does not exceed 126 colonies/100*

*ml nor exceed a maximum of 298 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 158 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water contact sports.*

**Criteria Exceeded:**

Big Prairie Creek was first included on Alabama's §303(d) list for pathogens in 2018 based on ADEM data collected in 2016 at stations BPRH-44B and BPRH-44C. Monthly sample results for *E. coli* showed three out of eight samples exceeded the single sample criterion at station BPRH-44B and two out of eight samples exceeded the single sample criterion at station BPRH-44C. Cottonwood Creek was first included on Alabama's §303(d) list for pathogens (*E. coli*) in 2024 based on data collected by ADEM in 2021 at station COTH-57C. Monthly sample results taken from station COTH-57C for *E. coli* showed four out of eight samples exceeded the single sample criterion. Big German was first included on Alabama's §303(d) list for pathogens (*E. coli*) in 2024 based on data collected by ADEM in 2021 at station BGEH-46A. Monthly sample results showed that seven out of eight samples exceeded the single sample criterion. All listing data can be found in Appendix 7.2.

## **3.0 Technical Basis for TMDL Development**

### **3.1 Water Quality Target Identification**

For the purposes of this TMDL, a single sample maximum *E. coli* target of 268.2 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the single sample maximum criterion of 298 colonies/100 ml. This target is considered protective of water quality standards and should not allow the single sample maximum of 298 colonies/100 ml to be exceeded. In addition, a geometric mean *E. coli* target of 113.4 colonies/100 ml will be used for a series of at least five samples taken no less than 24 hours apart over the course of 30 days. This target was derived by using a 10% explicit margin of safety from the geometric mean maximum of 126 colonies/100 ml criterion. This target is considered protective of water quality standards and should not allow the geometric mean of 126 colonies/100 ml to be exceeded.

## 3.2 Source Assessment

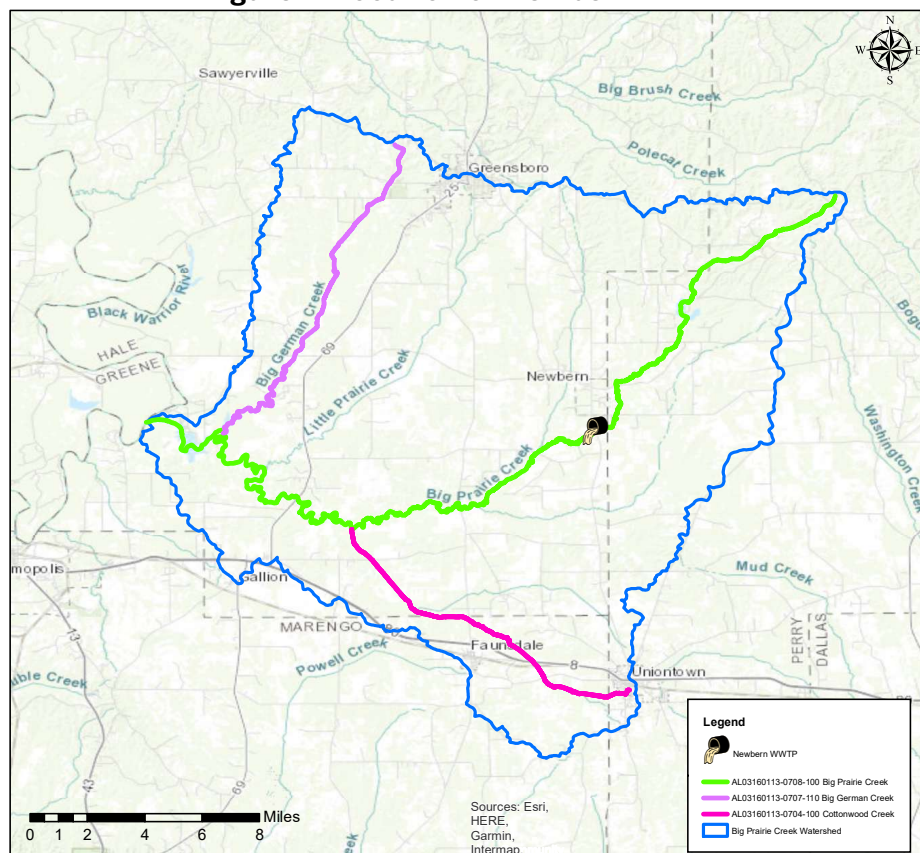
### 3.2.1 Point Sources in the Big Prairie Creek Watershed

A point source can be defined as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to municipal wastewater facilities, illicit discharges, and leaking sewer systems in urban areas. Municipal wastewater treatment facilities are permitted through the NPDES process administered by ADEM. In urban settings, sewer lines typically run parallel to streams in the floodplain. If a leaking sewer line is present, high concentrations of bacteria can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging bacteria when not permitted, or when the pathogens criterion established in the issued NPDES permit is not being upheld.

There is currently one NPDES-regulated continuous point source (wastewater treatment plant) permitted to discharge to surface water in the Big Prairie Creek watershed. The Newbern WWTP (AL0084498) discharges to Big Prairie Creek. The current permit limits for this facility are the applicable pathogen criteria for the F&W use classifications and are as follows:

- Monthly average (May – October): 126 colonies/ 100 ml
- Monthly average (November – April): 548 colonies; 100 ml
- Daily maximum (May – October): 298 colonies/ 100 ml
- Daily maximum (November – April): 2507 colonies/ 100 ml

**Figure 2. Location of Newbern WWTP**



The Uniontown WWTF is located within the Cottonwood Creek watershed but is currently permitted to discharge to a sprayfield located outside of the watershed. Since this facility is not permitted to discharge treated wastewater to a surface water of the state, it will not be given an allocation in this TMDL.

There are currently several dischargers with General NPDES Permits (construction, salvage and recycling, etc.) in the Big Prairie Creek watershed. These facilities are not required to monitor *E. coli* and are not considered to be a source of pathogens due to the nature of their operations. As such, no *E. coli* loading will be attributed to these facilities, nor will they receive an allocation in this TMDL.

The Big Prairie Creek watershed does not presently qualify as a municipal separate storm sewer system (MS4) area. In addition, there are currently no voluntary Animal Feeding Operation/Concentrated Animal Feeding Operation (AFO/CAFO) facilities located within the Big Prairie Creek watershed. The ADEM AFO/CAFO rules prohibit discharges of pollutants from the facilities and their associated waste land application activities. As a result, future AFOs/CAFOs will receive a waste load allocation of zero.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger or collection system operator for non-permitted “collection only” systems to ensure that releases do not occur. Unfortunately, releases to surface waters from SSOs are not always preventable or reported. From review of ADEM files, it was found that two facilities reported SSOs within the TMDL watershed during 2020 to 2024. A list of these SSOs can be found in Appendix 7.3.

There are currently two registered sites in the Big Prairie Creek watershed (one each in the Cottonwood Creek and Big German Creek watersheds) where land application of by-products for beneficial use is present. Beneficial use sites are regulated by ADEM’s Land Division and are required to implement appropriate best management practices (BMPs) and agronomic application rates to protect the environment.

Any future NPDES-regulated discharges that are considered by the Department to be a pathogen source will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

### **3.2.2 Nonpoint Sources in the Big Prairie Creek Watershed**

Nonpoint sources of bacteria do not have a defined discharge point but rather occur over the entire length of a stream or waterbody. On the land surface, bacteria can accumulate over time and be washed into streams or waterbodies during rain events. Therefore, there is some net loading of bacteria into streams as dictated by the watershed hydrology.

Agricultural land can be a source of *E. coli* bacteria. Stormwater runoff from pastures and animal feeding areas can be a source of *E. coli*. There are numerous farm ponds in the watershed which may be an *E. coli* source. In addition, improper land application of animal wastes and animals with direct access to streams are also mechanisms that can contribute bacteria to waterbodies. To account for the potential influence from animals with direct

access to stream reaches in the watershed, *E. coli* loads can be calculated as a direct source into the stream.

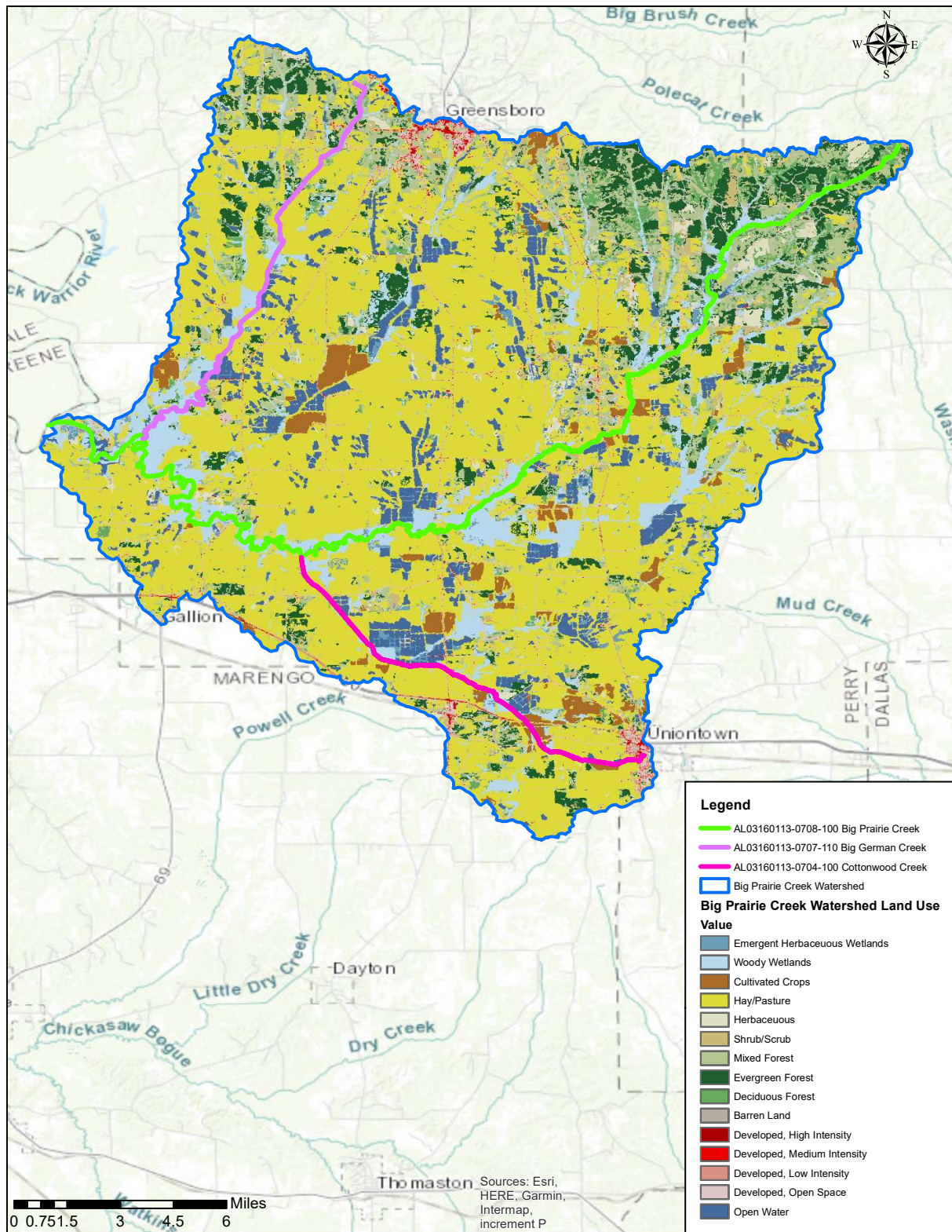
*E. coli* bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkey, waterfowl, etc. Wildlife will deposit feces onto land surfaces, where it can be transported during rainfall events to nearby streams. Control of these sources is usually limited to land management BMPs and may be impracticable in most cases. As a result, forested areas are not specifically targeted in this TMDL.

*E. coli* loading from developed areas is potentially attributable to multiple sources including storm water runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. On-site septic systems may be direct or indirect sources of bacterial pollution via ground and surface waters due to system failures and malfunctions.

### **3.3 Land Use Assessment**

Land use for the Big Prairie Creek watershed was determined using ArcMap with land use datasets derived from the 2021 National Land Cover Dataset (NLCD). The total drainage area of the Big Prairie Creek watershed is approximately 257 square miles. Figures 3 and 4 and Table 7 depict the primary land uses in the Big Prairie Creek watershed.

**Figure 3. Land Use in the Big Prairie Creek Watershed**

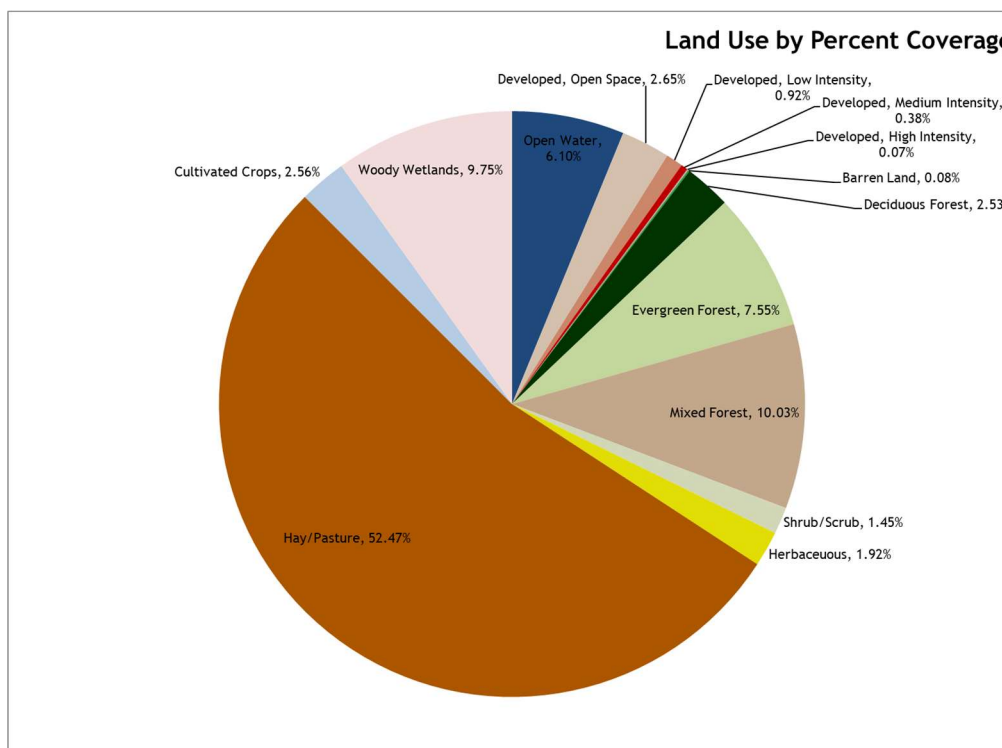


**Table 7: Land Use (2021) in the Big Prairie Creek Watershed**

| Class Description            | Count (30m)   | mi <sup>2</sup> | Acres            | Percent        |
|------------------------------|---------------|-----------------|------------------|----------------|
| Open Water                   | 45116         | 15.68           | 10033.56         | 6.10%          |
| Developed, Open Space        | 19603         | 6.81            | 4359.61          | 2.65%          |
| Developed, Low Intensity     | 6816          | 2.37            | 1515.84          | 0.92%          |
| Developed, Medium Intensity  | 2774          | 0.96            | 616.92           | 0.38%          |
| Developed, High Intensity    | 515           | 0.18            | 114.53           | 0.07%          |
| Barren Land                  | 603           | 0.21            | 134.10           | 0.08%          |
| Deciduous Forest             | 18730         | 6.51            | 4165.45          | 2.53%          |
| Evergreen Forest             | 55828         | 19.40           | 12415.86         | 7.55%          |
| Mixed Forest                 | 74147         | 25.77           | 16489.91         | 10.03%         |
| Shrub/Scrub                  | 10729         | 3.73            | 2386.07          | 1.45%          |
| Herbaceous                   | 14229         | 4.94            | 3164.46          | 1.92%          |
| Hay/Pasture                  | 388023        | 134.83          | 86294.30         | 52.47%         |
| Cultivated Crops             | 18921         | 6.57            | 4207.93          | 2.56%          |
| Woody Wetlands               | 72089         | 25.05           | 16032.22         | 9.75%          |
| Emergent Herbaceous Wetlands | 11354         | 3.95            | 2525.07          | 1.54%          |
| <b>TOTALS →</b>              | <b>739477</b> | <b>256.96</b>   | <b>164455.85</b> | <b>100.00%</b> |

| Class Description        | Count (30m)   | Mi <sup>2</sup> | Acres            | Percent        |
|--------------------------|---------------|-----------------|------------------|----------------|
| Open Water               | 45116         | 15.68           | 10033.56         | 6.10%          |
| Agricultural Lands       | 406944        | 141.41          | 90502.24         | 55.03%         |
| Forested / Natural       | 257106        | 89.34           | 57179.04         | 34.77%         |
| Developed Land (Grouped) | 30311         | 10.53           | 6741.01          | 4.10%          |
| <b>TOTALS →</b>          | <b>739477</b> | <b>256.96</b>   | <b>164455.85</b> | <b>100.00%</b> |

**Figure 4: Pie Chart of Land Use Distribution in the Big Prairie Creek Watershed**



Most of the Big Prairie Creek watershed is comprised of agricultural lands (55.03%) and forested and natural lands (34.77%). The remaining land use is approximately 6.10% open water and 4.10% developed land. Developed land includes both commercial and residential land uses.

### 3.4 Linkage between Numeric Targets and Sources

The predominant land usage in the Big Prairie Creek watershed is agricultural lands, followed by forested/natural lands. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in the Big Prairie Creek watershed are from the agricultural land uses, unpermitted discharges of wastewater, and leaking or failing septic tanks. It is not considered a logical approach to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for the various nonpoint sources. The loadings will be calculated as a single total nonpoint source load and reduction.

### 3.5 Data Availability and Analysis

During 2021 and 2024, ADEM conducted sampling in the Big Prairie Creek watershed to assess the water quality of the impaired streams. For purposes of this TMDL, the data from 2021 and 2024 will be used to assess the water quality of the Big Prairie Creek watershed because it is the most current data and provides the best picture of the current water quality conditions of the streams. The 2026 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody.

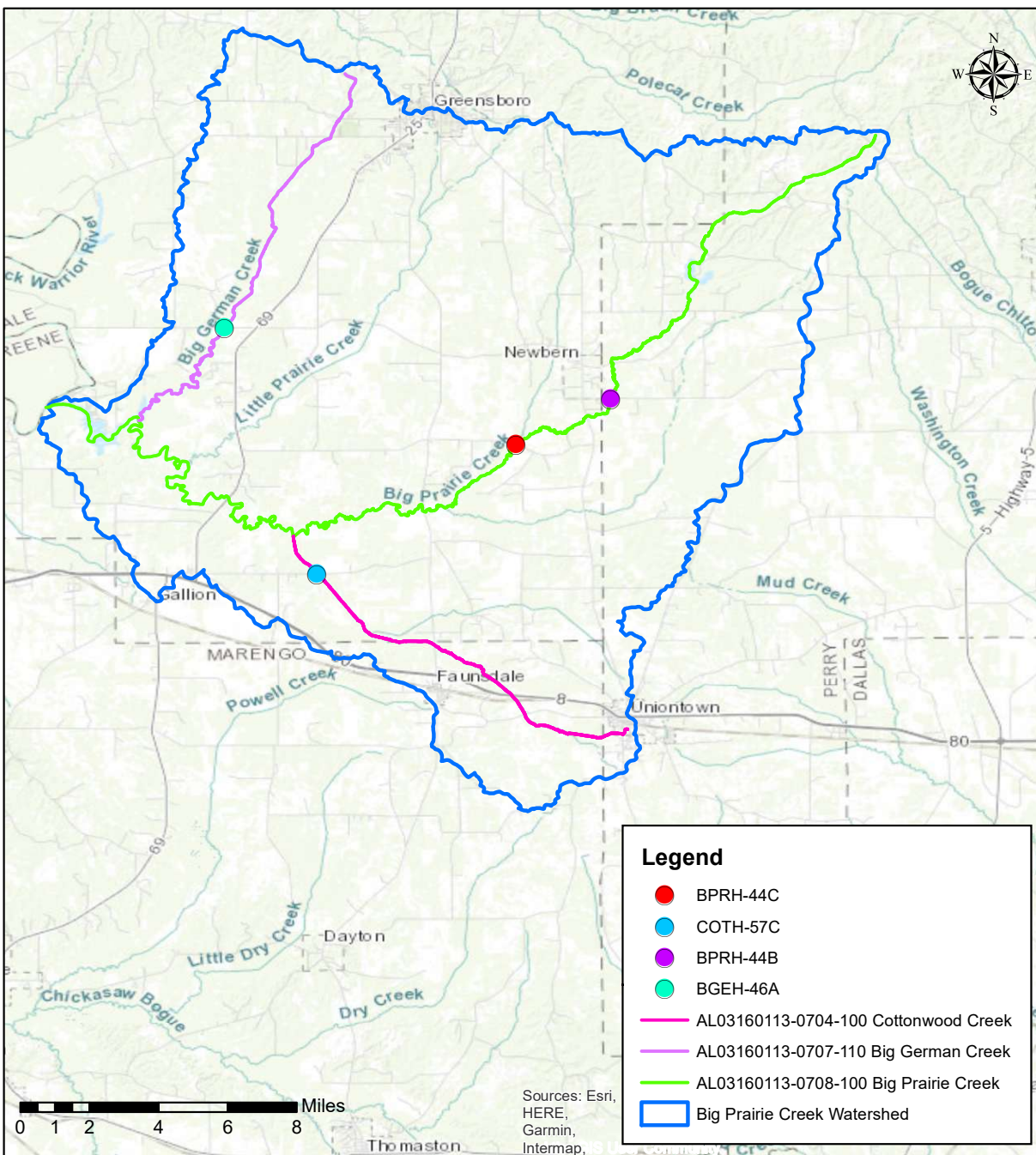
ADEM collected water quality data for the Big Prairie Creek watershed at stations BPRH-44B, BPRH-44C, COTH-57C, and BGEH-46A. A description of each station location can be found in Table 8 and a map showing the station locations can be found in Figure 5.

A total of 54 *E. coli* samples were collected in the Big Prairie Creek watershed between 2021 and 2024 with 15 samples from BPRH-44B, 15 samples from BPRH-44C, eight samples from COTH-57C, and 16 samples from BGEH-46A. There were violations of the applicable single sample criterion at each station and geometric mean exceedances at stations BPRH-44B and BPRH-44C. A complete list of the data used in this report and photographs at the stations can be found in Appendices 7.2 and 7.4, respectively.

**Table 8: ADEM Sampling Stations in the Big Prairie Creek Watershed**

| Station Name | Latitude    | Longitude    | Description                               |
|--------------|-------------|--------------|---|
| BPRH-44B     | 32.582759   | -87.520995   | Big Prairie Creek at Perry County Road 20 |
| BPRH-44C     | 32.5638     | -87.56066    | Big Prairie Creek at Hale County Road 10  |
| COTH-57C     | 32.50946    | -87.64409    | Cottonwood Creek at Hale County Road 12   |
| BGEH-46A     | 32.61248698 | -87.68284571 | Big German Creek at Hale County Road 16   |

**Figure 5: ADEM Sampling Stations in the Big Prairie Creek Watershed**



**Table 9. 2024 *E. coli* data for stations BPRH-44B and BPRH-44C**

| Station ID | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i><br>Criterion<br>(col/100 ml) | Geometric<br>Mean<br>(col/100 ml) | Geometric<br>Mean Criterion<br>(col/100 ml) | Flow<br>(cfs) |
|------------|------------|--------------------------------|-----------------------|---|-----------------------------------|---|---------------|
| BPRH-44B   | 3/26/2024  | 2419.6                         | G                     | 2507  |                                   |   | -             |
| BPRH-44B   | 4/9/2024   | 81.6                           | -                     | 2507  |                                   |   | -             |
| BPRH-44B   | 5/21/2024  | 64.6                           | -                     | 298   | 116.9                             | 126   | -             |
| BPRH-44B   | 6/10/2024  | 232.5                          | -                     | 298   |                                   |   | 8.076         |
| BPRH-44B   | 6/11/2024  | 290.9                          | -                     | 298   |                                   |   | 5.728         |
| BPRH-44B   | 6/13/2024  | 48.7                           | -                     | 298   |                                   |   | 3.665         |
| BPRH-44B   | 6/17/2024  | 102.4                          | -                     | 298   |                                   |   | 2             |
| BPRH-44B   | 7/11/2024  | 344.8                          | -                     | 298   |                                   |   | 7.689         |
| BPRH-44B   | 8/12/2024  | 435.2                          | -                     | 298   |                                   |   | 0.915         |
| BPRH-44B   | 8/13/2024  | 150                            | -                     | 298   | 210.4                             | 126   | 0.531         |
| BPRH-44B   | 8/14/2024  | 172.2                          | -                     | 298   |                                   |   | 0.436         |
| BPRH-44B   | 8/15/2024  | 160.7                          | -                     | 298   |                                   |   | 0.44          |
| BPRH-44B   | 8/29/2024  | 228.2                          | -                     | 298   |                                   |   | 0.15          |
| BPRH-44B   | 9/24/2024  | 209.8                          | -                     | 298   |                                   |   | 1.242         |
| BPRH-44B   | 10/29/2024 | 410.6                          | -                     | 298   |                                   | -   |               |
| BPRH-44C   | 3/26/2024  | 2419.6                         | G                     | 2507  |                                   |   | -             |
| BPRH-44C   | 4/9/2024   | 325.5                          | -                     | 2507  |                                   |   | -             |
| BPRH-44C   | 5/21/2024  | 118.8                          | -                     | 298   | 186.9                             | 126   | -             |
| BPRH-44C   | 6/10/2024  | 236.5                          | -                     | 298   |                                   |   | 12.44         |
| BPRH-44C   | 6/11/2024  | 435.2                          | -                     | 298   |                                   |   | 13.71         |
| BPRH-44C   | 6/13/2024  | 121.1                          | -                     | 298   |                                   |   | 6.147         |
| BPRH-44C   | 6/17/2024  | 154.2                          | -                     | 298   |                                   |   | 3.919         |
| BPRH-44C   | 7/11/2024  | 248.9                          | -                     | 298   |                                   |   | 10.79         |
| BPRH-44C   | 8/12/2024  | 547.5                          | -                     | 298   |                                   |   | 1.958         |
| BPRH-44C   | 8/13/2024  | 290.9                          | -                     | 298   | 515.0                             | 126   | 2.87**        |
| BPRH-44C   | 8/15/2024  | 579.4                          | -                     | 298   |                                   |   | 2.912**       |
| BPRH-44C   | 8/19/2024  | 3972.6                         | -                     | 298   |                                   |   | 3.252**       |
| BPRH-44C   | 8/29/2024  | 98.8                           | -                     | 298   |                                   |   | 0.901         |
| BPRH-44C   | 9/24/2024  | 172.3                          | -                     | 298   |                                   |   | 2.954         |
| BPRH-44C   | 10/29/2024 | 88.4                           | -                     | 298   |                                   | 0.924                                       |               |

\*G denotes that the actual number was probably greater than the number reported.

\*\*Flows were not measured by ADEM; flows calculated based on a ratio from USGS gauge 02466500.

**Table 10: 2021 *E. coli* data for station COTH-57C**

| Station ID | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i> Criterion<br>(col/100 ml) | Flow<br>(cfs) |
|------------|------------|--------------------------------|-----------------------|--|---------------|
| COTH-57C   | 3/25/2021  | 1413.6                         | -                     | 2507                                     | -             |
| COTH-57C   | 5/12/2021  | 2419.6                         | G                     | 298                                      | -             |
| COTH-57C   | 6/10/2021  | 2419.6                         | G                     | 298                                      | -             |
| COTH-57C   | 6/24/2021  | 160.7                          | -                     | 298                                      | 12.483        |
| COTH-57C   | 7/21/2021  | 2419.6                         | G                     | 298                                      | -             |
| COTH-57C   | 8/4/2021   | 2419.6                         | G                     | 298                                      | 51.035        |
| COTH-57C   | 9/14/2021  | 151.5                          | -                     | 298                                      | 6.995         |
| COTH-57C   | 10/14/2021 | 201.4                          | -                     | 298                                      | 2.356         |

\*G denotes that the actual number was probably greater than the number reported.

**Table 11. 2021 & 2024 *E. coli* data for BGEH-46A**

| Station ID | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i> Criterion<br>(col/100 ml) | Flow<br>(cfs) |
|------------|------------|--------------------------------|-----------------------|--|---------------|
| BGEH-46A   | 3/25/2021  | 2419.6                         | -                     | 2507                                     | -             |
| BGEH-46A   | 5/12/2021  | 1046.2                         | -                     | 298                                      | 16.413        |
| BGEH-46A   | 6/10/2021  | 2419.6                         | G                     | 298                                      | -             |
| BGEH-46A   | 6/24/2021  | 980.4                          | -                     | 298                                      | 13.863        |
| BGEH-46A   | 7/21/2021  | 1119.9                         | -                     | 298                                      | 37.6          |
| BGEH-46A   | 8/4/2021   | 1203.3                         | -                     | 298                                      | 7.753         |
| BGEH-46A   | 9/14/2021  | 2419.6                         | G                     | 298                                      | 14.025        |
| BGEH-46A   | 10/14/2021 | 770.1                          | -                     | 298                                      | 4.159         |
| BGEH-46A   | 3/26/2024  | 2419.6                         | G                     | 2507                                     | -             |
| BGEH-46A   | 4/9/2024   | 1203.3                         | -                     | 2507                                     | -             |
| BGEH-46A   | 5/21/2024  | 300                            | -                     | 298                                      | -             |
| BGEH-46A   | 6/17/2024  | 980.4                          | -                     | 298                                      | 3.579         |
| BGEH-46A   | 7/11/2024  | 201.4                          | -                     | 298                                      | -             |
| BGEH-46A   | 8/29/2024  | 238.2                          | -                     | 298                                      | -             |
| BGEH-46A   | 9/24/2024  | 186                            | -                     | 298                                      | 1.15          |
| BGEH-46A   | 10/29/2024 | 70.3                           | -                     | 298                                      | -             |

\*G denotes that the actual number was probably greater than the number reported.

### 3.6 Critical Conditions/Seasonal Variation

Critical conditions typically occur during the summer months (May – October). This can be explained by the nature of storm events in the summer versus the winter. In summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of bacteria into streams, resulting in spikes of bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of bacteria on the land surface, resulting in a more uniform loading rate.

The waterbodies in the Big Prairie Creek watershed generally follow the trends described above for the summer months of May through October. The critical conditions for the pathogen TMDLs were taken to be those with the highest *E. coli* single sample exceedance values. The use of the highest exceedances to calculate the TMDLs is expected to be protective of water quality in these waterbodies year-round.

### 3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) by implicitly incorporating the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

The MOS accounts for the uncertainty associated with the limited availability of data used in this analysis. An explicit MOS was applied to the TMDL by reducing the appropriate target criterion concentration by ten percent and calculating a mass loading target with measured or calculated flow data. The single sample maximum *E. coli* criterion of 298 colonies/100 ml

was reduced by 10% to 268.2 colonies/100 ml, while the geometric mean criterion of 126 colonies/100 ml was reduced in the same fashion to 113.4 colonies/100 ml.

## 4.0 TMDL Development

### 4.1 Definition of a TMDL

A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). The margin of safety can be included either explicitly or implicitly and accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. As discussed earlier, MOS is explicit in this TMDL. A TMDL can be denoted by the equation:

$$\text{TMDL} = \Sigma \text{WLAs} + \Sigma \text{LAs} + \text{MOS}$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i).

### 4.2 Load Calculations

A mass balance approach was used to calculate the pathogen TMDLs for the Big Prairie Creek watershed. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the *E. coli* concentrations times the in-stream flows times a conversion factor. Existing loads were calculated for the highest single sample exceedance and the highest geometric mean sample exceedance. In the same manner, allowable loads were calculated for both the single sample criterion and geometric mean criterion. The TMDL was based on the violation that produced the highest percent reduction of *E. coli* loads necessary to achieve applicable water quality criteria, whether it was the single sample or geometric mean.

#### **Existing Conditions**

The **single sample** mass loading was calculated by multiplying the highest single sample *E. coli* concentration by the estimated or measured flow at the time the sample was taken. The *E. coli* concentration times the flow and the conversion factor gives the total mass loading (colonies per day) of *E. coli* to the waterbody under the single sample exceedance condition.

For Big Prairie Creek:

$$\frac{3.25 \text{ ft}^3}{\text{s}} \times \frac{3972.6 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.16 \times 10^{11} \text{ colonies}}{\text{day}}$$

For Cottonwood Creek:

$$\frac{51.04 \text{ ft}^3}{\text{s}} \times \frac{2419.6 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.02 \times 10^{12} \text{ colonies}}{\text{day}}$$

For Big German Creek:

$$\frac{14.03 \text{ ft}^3}{\text{s}} \times \frac{2419.6 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{8.30 \times 10^{11} \text{ colonies}}{\text{day}}$$

The **continuous point source** mass loading is typically calculated by taking the average discharge flow from the month of the highest exceedance in Big Prairie Creek and multiplying that by the reported maximum *E.coli* value for the same month for the facility. The permit for the Newbern WWTP was issued in December 2024; therefore, the facility was not discharging to Big Prairie Creek during the month of August 2024.

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean exceedance concentration of 515.0 colonies/100 ml by the average of the flows over the geometric mean sampling period. This concentration was based on measurements at station BPRH-44C between August 12, 2024, and August 29, 2024, which are shown in Table 9. The average stream flow was calculated to be 2.38 cfs. The product of these two values and the conversion factor gives the total mass loading (colonies per day) of *E. coli* to Big Prairie Creek under the geometric mean exceedance condition.

$$\frac{2.38 \text{ ft}^3}{\text{s}} \times \frac{515.0 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.00 \times 10^{10} \text{ colonies}}{\text{day}}$$

### **Allowable Conditions**

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample and geometric mean criteria. This was done by taking the product of the measured or estimated flow for the violation event, the allowable concentration, and the conversion factor.

For the **single sample** *E. coli* target concentration of 268.2 colonies/100 ml, the allowable *E. coli* loadings are shown below.

For Big Prairie Creek:

$$\frac{3.25 \text{ ft}^3}{\text{s}} \times \frac{268.2 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.13 \times 10^{10} \text{ colonies}}{\text{day}}$$

The explicit margin of safety of 29.8 colonies/100 ml equals a daily loading of:

$$\frac{3.25 \text{ ft}^3}{\text{s}} \times \frac{29.8 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.37 \times 10^9 \text{ colonies}}{\text{day}}$$

For Cottonwood Creek:

$$\frac{51.04 \text{ ft}^3}{\text{s}} \times \frac{268.2 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.35 \times 10^{11} \text{ colonies}}{\text{day}}$$

The explicit margin of safety of 29.8 colonies/100 ml equals a daily loading of:

$$\frac{51.04 \text{ ft}^3}{\text{s}} \times \frac{29.8 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.72 \times 10^{10} \text{ colonies}}{\text{day}}$$

For Big German Creek:

$$\frac{14.03 \text{ ft}^3}{\text{s}} \times \frac{268.2 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{9.20 \times 10^{10} \text{ colonies}}{\text{day}}$$

The explicit margin of safety of 29.8 colonies/100 ml equals a daily loading of:

$$\frac{14.03 \text{ ft}^3}{\text{s}} \times \frac{29.8 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.02 \times 10^{10} \text{ colonies}}{\text{day}}$$

The **continuous point source** allowable loading was calculated by multiplying the design flow of the Newbern WWTP by the *E.coli* daily maximum permit limitation of 298 colonies/100 ml. This value was then multiplied by a conversion factor to determine the appropriate loading.

For Newbern WWTP (AL0084498):

$$0.02 \text{ MGD} \times \frac{1.55 \text{ ft}^3}{\text{s} * \text{MGD}} \times \frac{298 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.26 \times 10^8 \text{ colonies}}{\text{day}}$$

For the **geometric mean** *E.coli* target concentration of 113.4 colonies/100 ml, the allowable *E.coli* loading is:

$$\frac{2.38 \text{ ft}^3}{\text{s}} \times \frac{113.4 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{6.60 \times 10^9 \text{ colonies}}{\text{day}}$$

The explicit margin of safety of 12.6 colonies/100 ml equals a daily loading of:

$$\frac{2.38 \text{ ft}^3}{\text{s}} \times \frac{12.6 \text{ colonies}}{100 \text{ ml}} \times \frac{24,465,755 * 100 \text{ ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{7.33 \times 10^8 \text{ colonies}}{\text{day}}$$

The difference between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the *E. coli* water quality criteria. The TMDLs were calculated as the total daily *E. coli* loads to each waterbody. Table 12, 13, and 14 show the existing and allowable *E. coli* loads

and required reductions for Big Prairie Creek, Cottonwood Creek, and Big German Creek, respectively.

**Table 12: *E. coli* Loads and Required Reductions for Big Prairie Creek**

| Source                           | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|----------------------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load               | 3.16E+11                | 2.13E+10                 | 2.95E+11                     | 93%         |
| Geometric Mean Load              | 3.00E+10                | 6.60E+9                  | 2.34E+10                     | 78%         |
| Point Source Load (Newbern WWTP) | 0                       | 2.26E+8                  | 0                            | 0%          |

**Table 13. *E.coli* Loads and Required Reductions for Cottonwood Creek**

| Source             | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|--------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load | 3.02E+12                | 3.35E+11                 | 2.69E+12                     | 89%         |

**Table 14. *E.coli* Loads and Required Reductions for Big German Creek**

| Source             | Existing Load (col/day) | Allowable Load (col/day) | Required Reduction (col/day) | % Reduction |
|--------------------|-------------------------|--------------------------|------------------------------|-------------|
| Single Sample Load | 8.30E+11                | 9.20E+10                 | 7.38E+11                     | 89%         |

From the tables above, compliance with the single sample *E. coli* maximum criterion of 298 colonies/100 ml requires a reduction in the *E. coli* load of 93% for Big Prairie Creek, 89% for Cottonwood Creek, and 89% for Big German Creek. The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criteria in each waterbody are provided in the tables below.

**Table 15: *E. coli* TMDL for Big Prairie Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 2.37E+10          | 2.37E+9                | 2.26E+8                                  | N/A  | 0                                       | 2.11E+10             | 93%         |

Note: N/A = not applicable

a. Future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

**Table 16. *E. coli* TMDL for Cottonwood Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 3.72E+11          | 3.72E+10               | N/A                                      | N/A  | 0                                       | 3.35E+11             | 89%         |

Note: N/A = not applicable

a. Future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

**Table 17. *E. coli* TMDL for Big German Creek**

| TMDL <sup>e</sup> | Margin of Safety (MOS) | Waste Load Allocation (WLA) <sup>a</sup> |  |   | Load Allocation (LA) |             |
|-------------------|------------------------|--|--|---|----------------------|-------------|
|                   |                        | WWTPs <sup>b</sup>                       | Stormwater (MS4s and other NPDES sources) <sup>c</sup> | Leaking Collection Systems <sup>d</sup> |                      |             |
| (col/day)         | (col/day)              | (col/day)                                | % reduction  | (col/day)                               | (col/day)            | % reduction |
| 1.02E+11          | 1.02E+10               | N/A                                      | N/A  | 0                                       | 9.20E+10             | 89%         |

Note: N/A = not applicable

a. Future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.

b. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.

c. Future MS4 areas and other NPDES stormwater sources will be required to demonstrate consistency with the assumptions and requirements of this TMDL through implementation and maintenance of BMPs on a case-by-case basis.

d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.

e. TMDL was established using the single sample criterion of 298 colonies/100 ml.

### 4.3 TMDL Summary

Big Prairie Creek was placed on Alabama's §303(d) list for pathogens in 2018 based on data collected by ADEM in 2016. Cottonwood Creek and Big German Creek were first included on the §303(d) list for pathogens in 2024 based on data collected by ADEM in 2021. Additional data was collected in the Big Prairie Creek watershed in 2024. The 2021 and 2024 data provided the basis for TMDL development.

A mass balance approach was used to calculate the *E. coli* TMDLs for the Big Prairie Creek watershed. Based on the TMDL analysis, it was determined that a 93% reduction in *E. coli* loading was necessary to achieve compliance with applicable water quality standards for Big Prairie Creek and an 89% reduction in *E. coli* loading was necessary for both Cottonwood Creek and Big German Creek.

Compliance with the terms and conditions of existing and future NPDES sanitary and storm water permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

Required load reductions in the LA portion of this TMDL will be implemented through voluntary measures/best management practices (BMPs). Cooperation and active participation by the general public and various other groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities for nonpoint sources will be coordinated through interaction with local entities and may be eligible for CWA §319 grants through the Department's Nonpoint Source Unit.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Big Prairie Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

### 5.0 Follow-up Monitoring

ADEM has adopted a basin approach to water quality monitoring, an approach that divides Alabama's sixteen major river basins into three groups. Each year, ADEM's water quality resources are concentrated in one of the three basin groups and are divided among multiple priorities including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed. This monitoring will occur in each basin according to the schedule shown in Table 18.

**Table 18: Follow-up Monitoring Schedule**

| <b>River Basin Group</b>  | <b>Years to be Monitored</b> |
|---|------------------------------|
| Alabama, Cahaba, Mobile, Tallapoosa, Tennessee (Pickwick and Wilson)  | 2026/2029                    |
| Black Warrior, Blackwater, Chattahoochee, Chipola, Choctawhatchee, Escambia, Perdido, Tennessee (Wheeler), Yellow | 2027/2030                    |
| Coosa, Escatawpa, Tennessee (Guntersville), Tombigbee   | 2028/2031                    |

## 6.0 Public Participation

As part of the public participation process, this TMDL will be placed on public notice and made available for review and comment. The public notice and subject TMDL will be made available on ADEM's website: [www.adem.alabama.gov](http://www.adem.alabama.gov). In addition, the public notice will be submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. The public may also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or [kminton@adem.alabama.gov](mailto:kminton@adem.alabama.gov). The public will be given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period will become part of the administrative record. ADEM will consider all comments received by the public prior to final completion of this TMDL and subsequent submission to EPA Region 4 for final approval.

## 7.0 Appendices

### 7.1 References

ADEM Administrative Code, 2025. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2025. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's Monitoring Program. 2016, 2021, 2024. ADEM.

Alabama Department of Environmental Management (ADEM), *Alabama's Water Quality Assessment and Listing Methodology*, 2026.

Alabama's §303(d) List and Fact Sheet. 2018, 2020, 2022, 2024. ADEM.

Alabama Department of Environmental Management (ADEM), *Laboratory Data Qualification SOP #4910 Revision 7.2*, 2022.

United States Environmental Protection Agency, 1991. *Guidance for Water Quality-Based Decisions: The TMDL Process*. Office of Water. EPA 440/4-91-001.

United States Environmental Protection Agency, 1986. *Quality Criteria for Water*. Office of Water. EPA 440/4-91-001.

## 7.2 Water Quality Data

**Table 19. 2016-2024 *E. coli* data for Big Prairie Creek**

| Station ID | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i><br>Criterion<br>(col/100 ml) | Geometric<br>Mean<br>(col/100 ml) | Geometric<br>Mean Criterion<br>(col/100 ml) | Flow<br>(cfs) |
|------------|------------|--------------------------------|-----------------------|---|-----------------------------------|---|---------------|
| BPRH-44B   | 3/23/2016  | 108.1                          | -                     | 2507  |                                   |   | 37.8935       |
| BPRH-44B   | 4/13/2016  | 370                            | -                     | 2507  |                                   |   | -             |
| BPRH-44B   | 5/10/2016  | 120.1                          | -                     | 298   |                                   |   | 17.2046       |
| BPRH-44B   | 6/15/2016  | 832                            | H                     | 298   |                                   |   | -             |
| BPRH-44B   | 7/6/2016   | 218.7                          | H                     | 298   |                                   |   | 5.1428        |
| BPRH-44B   | 8/2/2016   | 410.6                          | H                     | 298   |                                   |   | 5.9702        |
| BPRH-44B   | 9/6/2016   | 770.1                          | H                     | 298   |                                   |   | 4.4244        |
| BPRH-44B   | 10/5/2016  | 62                             | H                     | 298   |                                   |   | 1.0009        |
| BPRH-44C   | 3/23/2016  | 116.2                          | -                     | 2507  |                                   |   | 17.3132       |
| BPRH-44C   | 4/13/2016  | 1158.8                         | -                     | 2507  |                                   |   | -             |
| BPRH-44C   | 5/10/2016  | 228.2                          | -                     | 298   |                                   |   | 24.8721       |
| BPRH-44C   | 6/15/2016  | 4839.2                         | GH                    | 298   |                                   |   | -             |
| BPRH-44C   | 7/6/2016   | 290.9                          | H                     | 298   |                                   |   | 7.1844        |
| BPRH-44C   | 8/2/2016   | 387.3                          | H                     | 298   |                                   |   | 7.6779        |
| BPRH-44C   | 9/6/2016   | 290.9                          | H                     | 298   |                                   |   | 5.6792        |
| BPRH-44C   | 10/5/2016  | 127.4                          | H                     | 298   |                                   |   | -             |
| BPRH-44B   | 3/26/2024  | 2419.6                         | G                     | 2507  |                                   |   | -             |
| BPRH-44B   | 4/9/2024   | 81.6                           | -                     | 2507  |                                   |   | -             |
| BPRH-44B   | 5/21/2024  | 64.6                           | -                     | 298   |                                   |   | -             |
| BPRH-44B   | 6/10/2024  | 232.5                          | -                     | 298   |                                   |   | 8.076         |
| BPRH-44B   | 6/11/2024  | 290.9                          | -                     | 298   | 116.9                             | 126   | 5.728         |
| BPRH-44B   | 6/13/2024  | 48.7                           | -                     | 298   |                                   |   | 3.665         |
| BPRH-44B   | 6/17/2024  | 102.4                          | -                     | 298   |                                   |   | 2             |
| BPRH-44B   | 7/11/2024  | 344.8                          | -                     | 298   |                                   |   | 7.689         |
| BPRH-44B   | 8/12/2024  | 435.2                          | -                     | 298   |                                   |   | 0.915         |
| BPRH-44B   | 8/13/2024  | 150                            | -                     | 298   |                                   |   | 0.531         |
| BPRH-44B   | 8/14/2024  | 172.2                          | -                     | 298   | 210.4                             | 126   | 0.436         |
| BPRH-44B   | 8/15/2024  | 160.7                          | -                     | 298   |                                   |   | 0.44          |
| BPRH-44B   | 8/29/2024  | 228.2                          | -                     | 298   |                                   |   | 0.15          |
| BPRH-44B   | 9/24/2024  | 209.8                          | -                     | 298   |                                   |   | 1.242         |
| BPRH-44B   | 10/29/2024 | 410.6                          | -                     | 298   |                                   |   | -             |
| BPRH-44C   | 3/26/2024  | 2419.6                         | G                     | 2507  |                                   |   | -             |
| BPRH-44C   | 4/9/2024   | 325.5                          | -                     | 2507  |                                   |   | -             |
| BPRH-44C   | 5/21/2024  | 118.8                          | -                     | 298   |                                   |   | -             |
| BPRH-44C   | 6/10/2024  | 236.5                          | -                     | 298   |                                   |   | 12.44         |
| BPRH-44C   | 6/11/2024  | 435.2                          | -                     | 298   | 186.9                             | 126   | 13.71         |
| BPRH-44C   | 6/13/2024  | 121.1                          | -                     | 298   |                                   |   | 6.147         |
| BPRH-44C   | 6/17/2024  | 154.2                          | -                     | 298   |                                   |   | 3.919         |
| BPRH-44C   | 7/11/2024  | 248.9                          | -                     | 298   |                                   |   | 10.79         |
| BPRH-44C   | 8/12/2024  | 547.5                          | -                     | 298   |                                   |   | 1.958         |
| BPRH-44C   | 8/13/2024  | 290.9                          | -                     | 298   |                                   |   | 1.04          |
| BPRH-44C   | 8/15/2024  | 579.4                          | -                     | 298   | 515.0                             | 126   | 0.861         |
| BPRH-44C   | 8/19/2024  | 3972.6                         | -                     | 298   |                                   |   | -             |
| BPRH-44C   | 8/29/2024  | 98.8                           | -                     | 298   |                                   |   | 0.901         |
| BPRH-44C   | 9/24/2024  | 172.3                          | -                     | 298   |                                   |   | 2.954         |
| BPRH-44C   | 10/29/2024 | 88.4                           | -                     | 298   |                                   |   | 0.924         |

\*G denotes that the actual number was probably greater than the number reported.

\* H denotes the analytical holding times are exceeded.

\*GH denotes the analytical holding times are exceeded. The actual number was probably greater than the number reported.

**Table 21. 2021 *E. coli* Data for Cottonwood Creek**

| Station ID   | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i><br>Criterion<br>(col/100 ml) | Flow<br>(cfs) |
|--|------------|--------------------------------|-----------------------|---|---------------|
| COTH-57C   | 3/25/2021  | 1413.6                         | -                     | 2507  | -             |
| COTH-57C   | 5/12/2021  | 2419.6                         | G                     | 298   | -             |
| COTH-57C   | 6/10/2021  | 2419.6                         | G                     | 298   | -             |
| COTH-57C   | 6/24/2021  | 160.7                          | -                     | 298   | 12.483        |
| COTH-57C   | 7/21/2021  | 2419.6                         | G                     | 298   | -             |
| COTH-57C   | 8/4/2021   | 2419.6                         | G                     | 298   | 51.035        |
| COTH-57C   | 9/14/2021  | 151.5                          | -                     | 298   | 6.995         |
| COTH-57C   | 10/14/2021 | 201.4                          | -                     | 298   | 2.356         |
| *G denotes that the actual number was probably greater than the number reported. |            |                                |                       |   |               |

**Table 23. 2021 and 2024 *E. coli* data for Big German Creek**

| Station ID   | Visit Date | <i>E. coli</i><br>(col/100 ml) | <i>E. coli</i><br>dc* | <i>E. coli</i><br>Criterion | Flow<br>(cfs) |
|--|------------|--------------------------------|-----------------------|-----------------------------|---------------|
| BGEH-46A   | 3/25/2021  | 2419.6                         | -                     | 2507                        | -             |
| BGEH-46A   | 5/12/2021  | 1046.2                         | -                     | 298                         | 16.413        |
| BGEH-46A   | 6/10/2021  | 2419.6                         | G                     | 298                         | -             |
| BGEH-46A   | 6/24/2021  | 980.4                          | -                     | 298                         | 13.863        |
| BGEH-46A   | 7/21/2021  | 1119.9                         | -                     | 298                         | 37.6          |
| BGEH-46A   | 8/4/2021   | 1203.3                         | -                     | 298                         | 7.753         |
| BGEH-46A   | 9/14/2021  | 2419.6                         | G                     | 298                         | 14.025        |
| BGEH-46A   | 10/14/2021 | 770.1                          | -                     | 298                         | 4.159         |
| BGEH-46A   | 3/26/2024  | 2419.6                         | G                     | 2507                        | -             |
| BGEH-46A   | 4/9/2024   | 1203.3                         | -                     | 2507                        | -             |
| BGEH-46A   | 5/21/2024  | 300                            | -                     | 298                         | -             |
| BGEH-46A   | 6/17/2024  | 980.4                          | -                     | 298                         | 3.579         |
| BGEH-46A   | 7/11/2024  | 201.4                          | -                     | 298                         | -             |
| BGEH-46A   | 8/29/2024  | 238.2                          | -                     | 298                         | -             |
| BGEH-46A   | 9/24/2024  | 186                            | -                     | 298                         | 1.15          |
| BGEH-46A   | 10/29/2024 | 70.3                           | -                     | 298                         | -             |
| *G denotes that the actual number was probably greater than the number reported. |            |                                |                       |                             |               |

### 7.3 SSO Summary

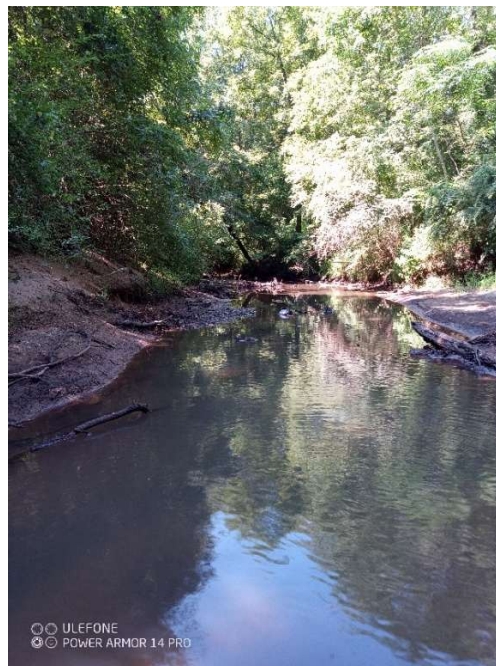
| Permit Number | Facility/Site Name                      | SSO Began Date | SSO Stopped Date | SSO Volume                    | SSO Latitude | SSO Longitude |
|---------------|---|----------------|------------------|-------------------------------|--------------|---------------|
| AL0057193     | Greensboro Lagoon                       | 3/5/2020       | 3/6/2020         | 8,000 gallons                 | 32.687732    | -87.613877    |
| AL0057193     | Greensboro Lagoon                       | 4/20/2020      | 4/21/2020        | 10,000 < gallons <= 25,000    | 32.687732    | -87.613877    |
| AL0057193     | Greensboro Lagoon                       | 5/29/2020      | 5/29/2020        | <=1,000 gallons               | 32.68461     | -87.59203     |
| AL0063657     | Uniontown Wastewater Treatment Facility | 5/31/2020      | 6/2/2020         | 1,000 < gallons <=10,000      | 32.436841    | -87.516195    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 5/31/2020      | 6/1/2020         | 50,000 < gallons <=75,000     | 32.442735    | -87.525973    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 6/7/2020       | 6/22/2020        | 75,000 < gallons <=100,000    | 32.442735    | -87.525973    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 7/10/2020      | 7/22/2020        | 50,000 < gallons <=75,000     | 32.442735    | -87.525973    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 8/18/2020      | 8/19/2020        | <=1,000 gallons               | 32.42554     | -87.519702    |
| AL0057193     | Greensboro Lagoon                       | 10/6/2020      | 10/7/2020        | 3,000 gallons                 | 32.69653     | -87.59471     |
| AL0057193     | Greensboro Lagoon                       | 10/29/2020     | 10/29/2020       | 1,000 < gallons <=10,000      | 32.69653     | -87.59471     |
| AL0063657     | Uniontown Wastewater Treatment Facility | 10/30/2020     | 10/31/2020       | 1,000 < gallons <=10,000      | 32.456425    | -87.520574    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 11/1/2020      | 11/9/2020        | 10,000 < gallons <= 25,000    | 32.442517    | -87.525147    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 12/2/2020      | 1/22/2021        | 25,000 < gallons <=50,000     | 32.442724    | -87.525994    |
| AL0057193     | Greensboro Lagoon                       | 1/19/2021      | 1/19/2021        | 1,500 gallons                 | 32.693333    | -87.605833    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 1/25/2021      | 1/26/2021        | 75,000 < gallons <=100,000    | 32.442724    | -87.525994    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 1/27/2021      | 6/9/2021         | 10,000 < gallons <= 25,000    | 32.442753    | -87.525973    |
| AL0057193     | Greensboro Lagoon                       | 2/18/2021      | 2/18/2021        | <=1,000 gallons               | 32.693613    | -87.605614    |
| AL0057193     | Greensboro Lagoon                       | 4/1/2021       | 4/1/2021         | <=1,000 gallons               | 32.69626     | -87.58793     |
| AL0063657     | Uniontown Wastewater Treatment Facility | 9/4/2021       | 9/6/2021         | 250,000 < gallons <=500,000   | 32.444728    | -87.515047    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 9/21/2021      | 10/25/2021       | 750,000 < gallons <=1,000,000 | 32.440833    | -87.526111    |
| AL0057193     | Greensboro Lagoon                       | 10/22/2021     | 10/22/2021       | <=1,000 gallons               | 32.6938      | -87.6054      |
| AL0063657     | Uniontown Wastewater Treatment Facility | 1/10/2022      | 1/17/2022        | 10,000 < gallons <= 25,000    | 32.44262691  | -87.52529236  |
| AL0057193     | Greensboro Lagoon                       | 3/23/2022      | 3/23/2022        | 1,000 < gallons <= 10,000     | 32.69225     | -87.59223     |
| AL0063657     | Uniontown Wastewater Treatment Facility | 4/5/2022       | 4/7/2022         | 75,000 < gallons <= 100,000   | 32.443696    | -87.512284    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 4/5/2022       | 4/6/2022         | 100,000 gallons               | 32.446674    | -87.521635    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 4/5/2022       | 4/6/2022         | 20,000 gallons                | 32.445598    | -87.522277    |
| AL0057193     | Greensboro Lagoon                       | 6/10/2022      | 6/15/2022        | 10,000 < gallons <= 25,000    | 32.6970893   | -87.5956079   |
| AL0057193     | Greensboro Lagoon                       | 7/21/2022      | 7/22/2022        | 1,000 < gallons <= 10,000     | 32.6967276   | -87.5949563   |
| AL0057193     | Greensboro Lagoon                       | 12/15/2022     | 12/15/2022       | 1,000 < gallons <= 10,000     | 32.6930987   | -87.6051076   |
| AL0057193     | Greensboro Lagoon                       | 1/12/2023      | 1/12/2023        | 1,500 gallons                 | 32.6838526   | -87.6243647   |
| AL0057193     | Greensboro Lagoon                       | 1/24/2023      | 1/24/2023        | <=1,000 gal                   | 32.7022979   | -87.6079577   |
| AL0063657     | Uniontown Wastewater Treatment Facility | 1/30/2023      | 1/31/2023        | 50,000 < gallons <= 75,000    | 32.44214011  | -87.5231135   |
| AL0063657     | Uniontown Wastewater Treatment Facility | 3/26/2023      | 3/27/2023        | 250,000 gallons               | 32.44474477  | -87.5265936   |
| AL0063657     | Uniontown Wastewater Treatment Facility | 6/16/2023      | 6/16/2023        | 10,000 < gallons <= 25,000    | 32.440979    | -87.513352    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 6/20/2023      | 6/20/2023        | 10,000 < gallons <= 25,000    | 32.440979    | -87.513352    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 7/13/2023      | 7/21/2023        | 10,000 < gallons <= 25,000    | 32.4430218   | -87.52555616  |
| AL0063657     | Uniontown Wastewater Treatment Facility | 8/15/2023      | 8/17/2023        | 1,000 < gallons <= 10,000     | 32.44591661  | -87.5127978   |
| AL0057193     | Greensboro Lagoon                       | 11/14/2023     | 11/14/2023       | 200 gallons                   | 32.697079    | -87.595581    |
| AL0063657     | Uniontown Wastewater Treatment Facility | 3/15/2024      | 5/3/2024         | 25,000 < gallons <= 50,000    | 32.44292791  | -87.52581254  |
| AL0063657     | Uniontown Wastewater Treatment Facility | 5/31/2024      | 5/31/2024        | 50,000 < gallons <= 75,000    | 32.44225392  | -87.52277371  |

## 7.4 Station Photographs

Figure 6. At Station BPRH-44B: Upstream View of Big Prairie Creek (8/12/2024)



Figure 7. At Station BPRH-44B: Downstream View of Big Prairie Creek (8/12/2024)



**Figure 8. At Station BPRH-44C: Upstream View of Big Prairie Creek (8/12/2024)**



**Figure 9. At Station BPRH-44C: Downstream View of Big Prairie Creek(8/12/2024)**



**Figure 10. At Station COTH-57C: Upstream View of Cottonwood Creek (8/19/2021)**



**Figure 11. At Station COTH-57C: Downstream View of Cottonwood Creek (8/19/2021)**



**Figure 12. At Station BGEH-46A: Upstream View of Big German Creek (8/4/2021)**



**Figure 13: At Station BGEH-46A: Downstream View of Big German Creek (8/4/2021)**

